

DREXEL

DYNAMICS
CORPORATION

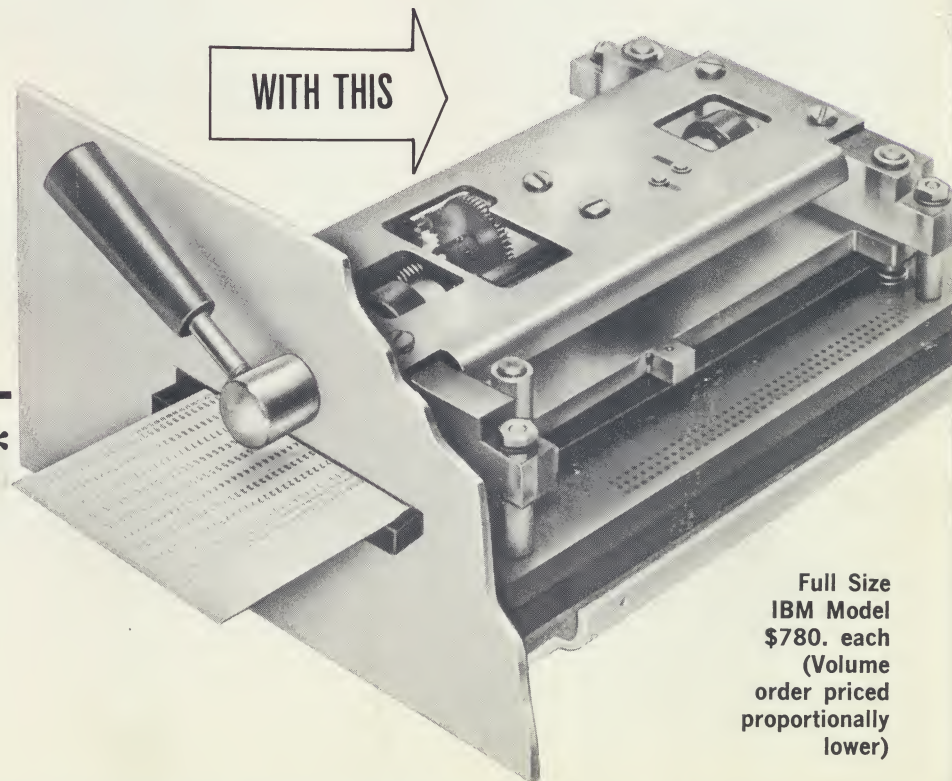
HORSHAM, PA. 19044 • (215) 672-2200 • TWX 215-675-3910

news release

if you are associated with INDUSTRIAL or EDP PROGRAMMING Here's the NEWS FLASH OF THE YEAR!

Drexel Dynamics Corporation, Horsham, Pa. has completed a two year Production Study and Tooling Program in order to offer you Military Quality and the same reliability in their commercial line of

PUNCHED CARD PROGRAMMERS



Less than 70¢ per switch*

- | | |
|-----------|---|
| SAVE | — Operator Time |
| INSURE | — Repeatability of Process |
| STORE | — Programs for Future Use |
| INTEGRATE | — With Present Cost Control |
| MAINTAIN | — With Present Electrical Control Personnel |

Full Size
IBM Model
\$780. each
(Volume
order priced
proportionally
lower)

*Selected Models in small quantities

DREXAMATIC® products for industry & aerospace

First Class

PERMIT NO. 9

SEC. 34.9, P.L.&R.

HORSHAM, PENNA.

B U S I N E S S R E P L Y M A I L

No Postage Stamp Necessary if Mailed in the United States

Postage will be paid by

DREXEL DYNAMICS CORPORATION

Maple Avenue

Horsham, Penna.



Please send information on the following Drexamatic products:

- ☐ **Military Card Programmers**
- ☐ **Industrial and Commercial Card Programmers**
- ☐ **Complete Data on Model** _____
- ☐ **Applications Information on** _____

☐ Have representative call.

NAME _____ TITLE _____

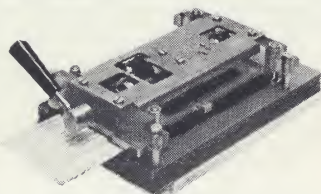
COMPANY _____

ADDRESS _____

CITY _____ STATE _____

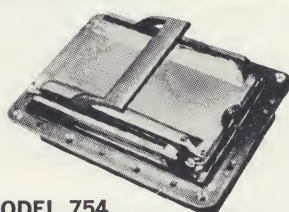
a complete line of *DREXAMATIC*[®] PUNCHED CARD PROGRAMMERS

for process control, machine control, test programming, computer input, production control, status indication and access limitation



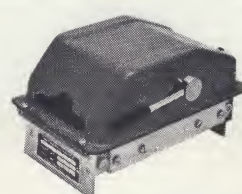
MODEL 2981

- Industrial full IBM reader
- Front panel space 3" x 7"
- Gold plated contacts rated 0.25 amp.
- Motor operation available
- Supplied bussed by column, bussed by row or 480 isolated switches



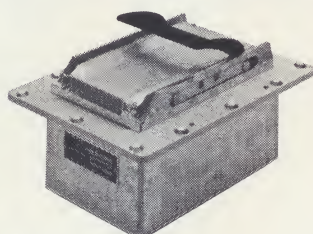
MODEL 754

- Rem-Rand format, full wiping action
- Models for industrial & MIL applications
- Rated up to 5.0 amperes per switch
- Supplied with normally open or normally closed contacts
- Size — 9 $\frac{1}{16}$ " x 6 $\frac{1}{16}$ " x 3 $\frac{1}{2}$ "



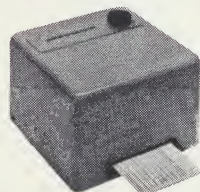
MODEL 2224

- High reliability military specifications
- IBM format to 960 switches
- Palladium clad—Gold platinum clad contacts, full wiping action
- Rated up to 2 amperes per switch
- Used in test set applications



MODEL 2392

- Minuteman reliability
- X-Rayed castings
- Special connections
- Rem-Rand format up to 540 switches
- Documented quality control



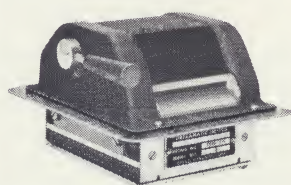
MODEL 2900

- Low cost industrial model
- IBM format, up to 264 switches
- Gold plated contacts, push button operation
- Contact rating 0.25 amperes DC
- Supplied bussed by column, bussed by row or 132 isolated switches



MODEL 2924

- Isolated switch industrial programmer
- Full IBM reader, 2 amp DC
- Remote switch operation
- Precious metal clad contacts
- Contacts tested to million cycles

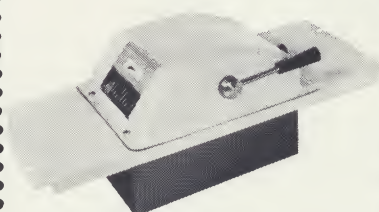


MODEL 2545

- IBM format up to 600 switches
- Commercial models available
- Used in space ground support equipment
- Precious metal contacts
- Full wiping action

other *DREXAMATIC* products include CARD PROGRAMMED:

- a. Potentiometers
- b. Sequencers
- c. Timers



CUSTOM and/or MODIFIED STANDARD DESIGNS

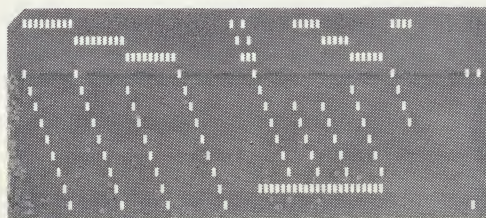
Our standard models can be modified with specially designed back planes, connections and mountings to meet a variety of individual requirements.

Write or call for bulletins and more information

DREXEL
DYNAMICS
CORPORATION

700 MAPLE AVENUE, HORSHAM, PA. (215) 927-6200

LET THIS DATA CARD . . . be your control board.
... it can switch 960 circuits simultaneously



*Reprinted from
Instruments and Control Systems*

Static Punched-Card Programming

by John E. McWade
Drexel Dynamics Corporation

Static Punched-Card Programming

JOHN E. MCWADE

Drexel Dynamics Corporation

The punched-card programmer combines the utility of a pinboard with the fast disconnect capability of the patchboard, with further advantages of convenient program storage and small size. Further, it can handle large blocks of data with high flexibility, as shown by the many programming applications discussed in detail.

PROGRAMMING of control and checkout system often can be done economically by parallel switching with punched-card static programmers rather than with more-expensive crossbar switches, core buffers, patchboards, pinboards and other storage devices. Both control and memory functions can be assigned to static card reader and a deck of punched cards, which are especially useful for applications not requiring continuous highspeed scanning, but needing aperiodic release of large data blocks (such as references, stimuli, circuit connections, address functions, etc.).

Punched Card Programmers available today (Fig. 1) provide full IBM format switching (960 switches) in a package not much wider than the card itself, and only a few inches in height. Current-carrying capabilities are relatively high, ranging up to several amperes per switch or higher, depending on the number in use. The switch contacts can carry RF as well as DC, with low inter-switch capacitance. Pulses at megacycle rates can be switched directly through the programmer, along with lines carrying DC and power-line frequencies.

Punched Card Readers are ideal for portable field checkout equipment, and are used in conjunction with a number of large military systems (Fig. 2). Many applications involve installation in weapon systems where important command and control functions can be reliably programmed with inherent coding security.

New design innovations in card readers now have achieved full wiping contact action in a plane normal



FIG. 1. CARD PROGRAMMER with 960 isolated switches for IBM format reading.

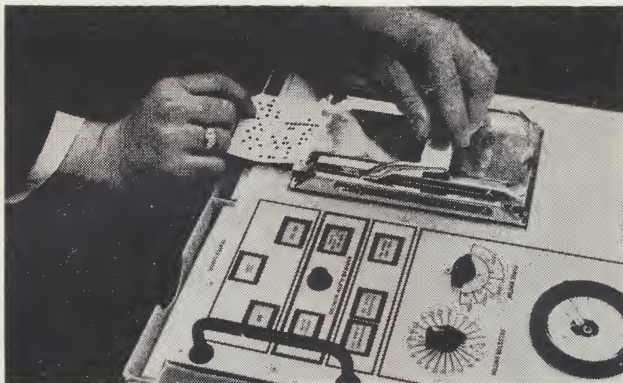


FIG. 2. MINUTEMAN portable checkout equipment uses 540-switch Remington Rand Format Card Programmer to test operational equipment readiness.

to the card, eliminating the headaches of horizontal wiping brushes that tend to drag card fibres into the switch recesses. The increasing use of readers in systems such as Minuteman, Polaris, Apollo, Saturn, and others, is evidence of their high reliability.

Standard paper-stock tab cards can be used for programming. Where durability against rough usage is desired, cards may be made of Mylar, polyvinyl chloride, or other plastics materials. Printed data can be included on the card, designating function or other explanatory information.

In comparison to other matrix switching devices, the punched-card programmer offers the utility of a pinboard with the fast-disconnect capability of the patchboard. Compared to a patchboard it offers the advantage of convenient card program storage, together with a substantial reduction in size.

Applications

The static card reader contains card-programmable single-pole switches. When wired properly, it serves as a matrix switchboard, providing circuit access to inject stimuli, references, command, loads, etc. The switches can be digitally coded to permit connection directly into computer memory or control circuits.

Digital applications of card readers include (1) providing switching interconnections to digital circuits to connect measurement instruments, loads, power, etc. for testing of digital logic modules; (2) controlling serial pattern pulse-generators to establish bit composition of pulse trains; (3) converting pulse codes by matrix switches of character level assign-

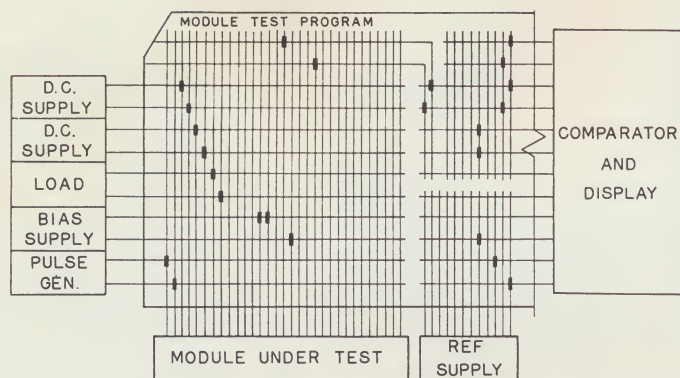


FIG. 3. TYPICAL TESTING switch matrix. Module receives supply voltages, load, bias, and pulses, simultaneously.

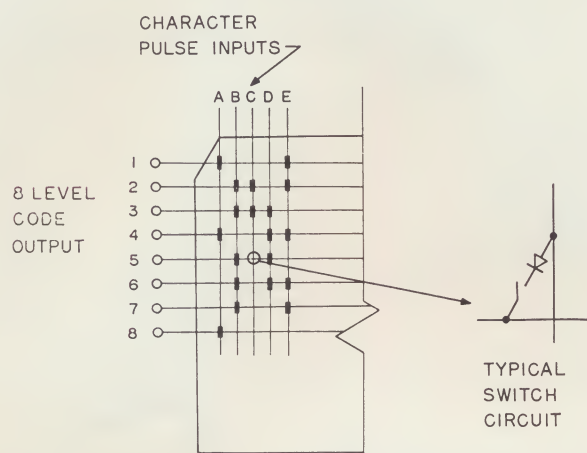


FIG. 4. PROGRAMMABLE ENCODER. Output 1 occurs for inputs A and E, output 2 for inputs B, C and E; etc.

ments; (4) access authorization control to computer storage; (5) computer readout formatting; (6) controlling displays of graphs maps, and alphanumeric messages; (7) establishing limit references for counters, DVM's and DOM's; (8) controlling digital logic interconnections, to permit rapid reprogramming of special-purpose computers and logic trainers, etc.

Analog applications include (1) controlling programmable time function-generators of waveform or aperiodic nonlinear analog functions; (2) controlling operational amplifier patching as an interconnection program for analog computers; (3) controlling precision reference levels of potential current, time, resistance, capacity, and frequency; (4) controlling distribution and parameters of comb filters for spectrum analysis and voice scrambling; (5) commanding position- and velocity-controlled mechanical servos for pointing and tracking systems; (6) establishing programmed patterns for psychological stimuli test systems and medical test instrumentation; (7) establishing reference offsets for bridge and linear variable differential transducer circuits; etc., etc.

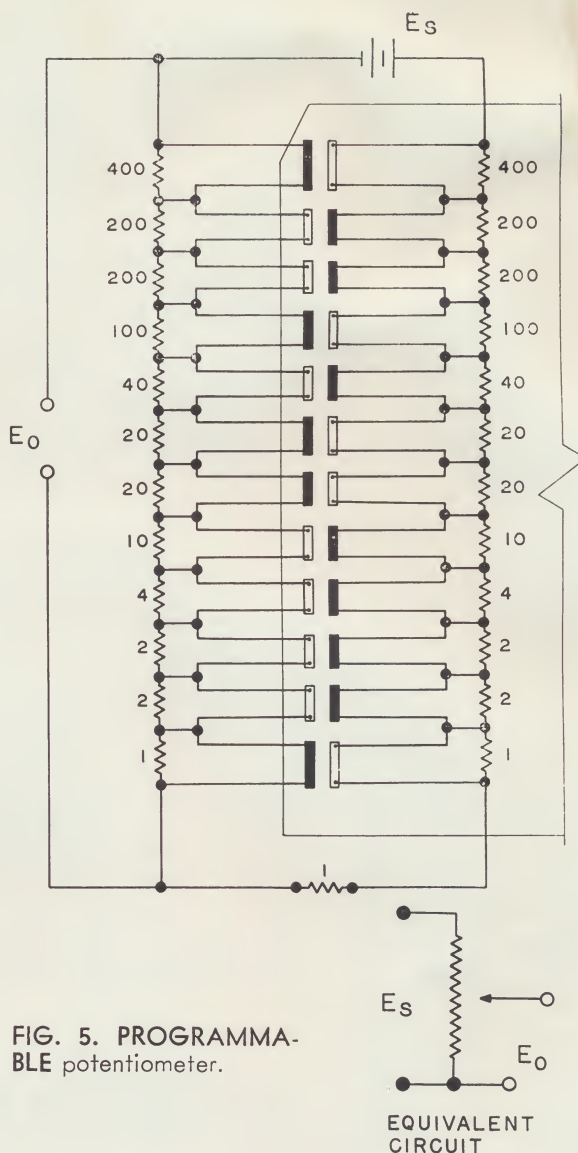


FIG. 5. PROGRAMMABLE potentiometer.

Card-Programmed Circuits

Fig. 3 shows a typical switching matrix to interconnect stimuli, references, comparator, and test unit. Punch positions indicate switch closure positions between wired busses. Switches may be unbussed or bussed in isolated matrices to suit the requirement. A full card of 960 switch positions can program up to 20 separate circuit inputs for each point on a 48-pin connector. Any alternate arrangement may be used where the product of input and output circuits does not exceed 960 for one programmer.

Fig. 4 shows how any number of parallel code level outputs may be programmed by appropriate switch closures through diode isolators. Variable encoding capability insures privacy of code transmission or permits complete flexibility of interfacing between incompatibility-coded data transmitters.

Fig. 5 shows a programmable potentiometer with constant input impedance and 0.1% resolution, using 1-2-2-4 BCD coding. One column of 12 switches adds

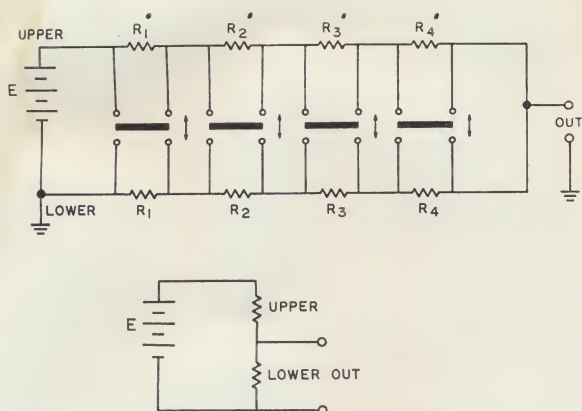
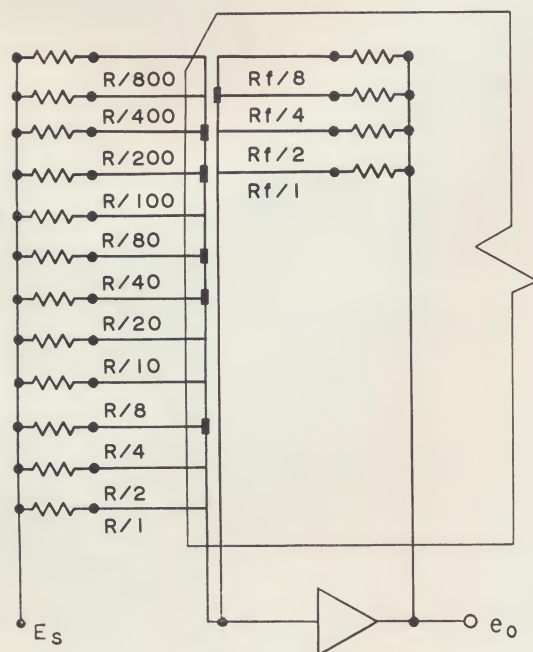


FIG. 6. PRINCIPLE of constant-impedance potentiometer.



or subtracts resistors below the divider pickoff, while the second column subtracts or adds resistors above the pickoff, in a complementing manner. The principle is shown in Fig. 6. The shorting bar permits R_1 or R_2' to be in the circuit, but not both. Moving the bar effectively switches the resistor from the top section to the bottom section, or *vice versa*. The switches in Fig. 5 must be of the isolated circuit type, Form A, B, or separately A and B in adjacent columns, to simplify punch coding. Potentiometer resolution is related to the number of decades per column, together with the intrinsic accuracy of each resistor. Output ratio is variable from 0 to 0.999 or 0.001 to 1.000, depending on the position of the output connection to the unswitched unity-weighted resistor. The resistance values indicated are relative, and not necessarily absolute.

Fig. 7 shows a waveform or pulse-pattern programmer using a punched card to develop curves or pulse train patterns directly analogous to the punched-hole distribution. Amplitude is determined by pickoff in

FIG. 7. WAVEFORM or pulse-pattern programmer.

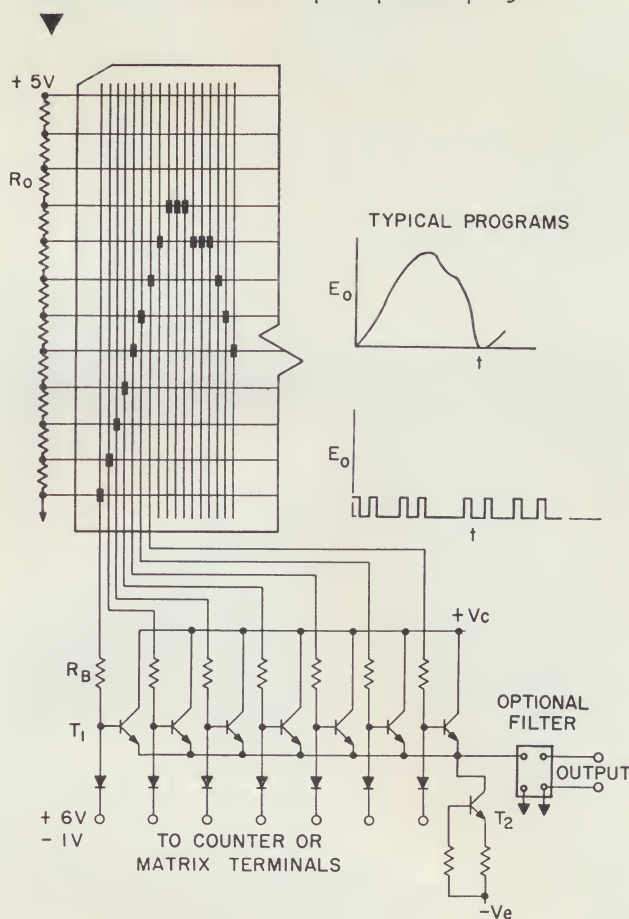


FIG. 8. PROGRAMMABLE summing amplifier.

each column axis from the voltage divider R_D . Matrix diodes gate the output. They are normally in the -1 V mode (cutoff), and are lifted to the cutoff level of $+6$ V when the step is required. T_1 's are parallel emitter-followers, with T_2 serving as a high dynamic emitter impedance. R_B buffers the divider to minimize loading, and should be a high resistance, consistent with an allowable amount of offset drop in the driven base circuit. The card matrix may be varied to alter the resolution in time or amplitude.

Fig. 8 shows how total input current to the node (summing junction) in an operational amplifier circuit is controlled by parallel-switched summing resistors. Resistor ohmic ratios are inversely proportional to current ratios, which are coded in BCD 1-2-4-8 manner. One column of 12 switches permits coding of input to 0.1%. Output voltage of the amplifier is proportional to the total input current, with R_f acting as the gain multiplier.

Card coding may also be in straight binary if increased coding resolution is desired.

DREXEL



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DREXAMATIC SERIES

AUTOFEED

80 Column and 22 Column

Preliminary Data Sheet

AN AUTOMATED STATIC READER FOR DATA ENTRY AND CONTROL PROGRAMMING

The Autofeed units combine the advantages of Dynamic and Static reading in a single integrated device. This eliminates the requirement for buffer memory and relay drives when the data word contains less than 960 bits.

Typical Applications

Machine Tool Programming
Test Equipment Programming
High Speed Parallel Data Entry
Stacker Crane Control
Batch Process Control

<u>Specifications</u>	<u>Autofeed 22 Column</u>	<u>Autofeed 80 Column</u>
Columns read	22	80
Number of Bits		
read per card	264	960
Contacts		Gold on Gold
Card Type		Standard IBM
Terminals		Gold plated 0.040" solder cups
Contact form		Normally open
Contact rating		0.25 amperes DC
Insulation resistance		Resistance load Greater than 500 megohms at 500 Vlc
Output Bussing		Bussed by 1/2 Col. by Row by Pair
Capacitance (Pin to Pin Max.)		5 Pico farads
Avg. Contact resistance		less than 50 milliohms
Stacker Capacity		100 cards *
Feeder Capacity		100 cards *
Total recycle time		4 seconds
Input power		110 Volts 60 cps AC
Approximate Size		30" L-7 1/2" D - 9 1/2" H
Table top mounting		

* May be increased on future models.

Specifications subject to change.